



North Dakota Wheat and Barley: “Your Healthier Choice”

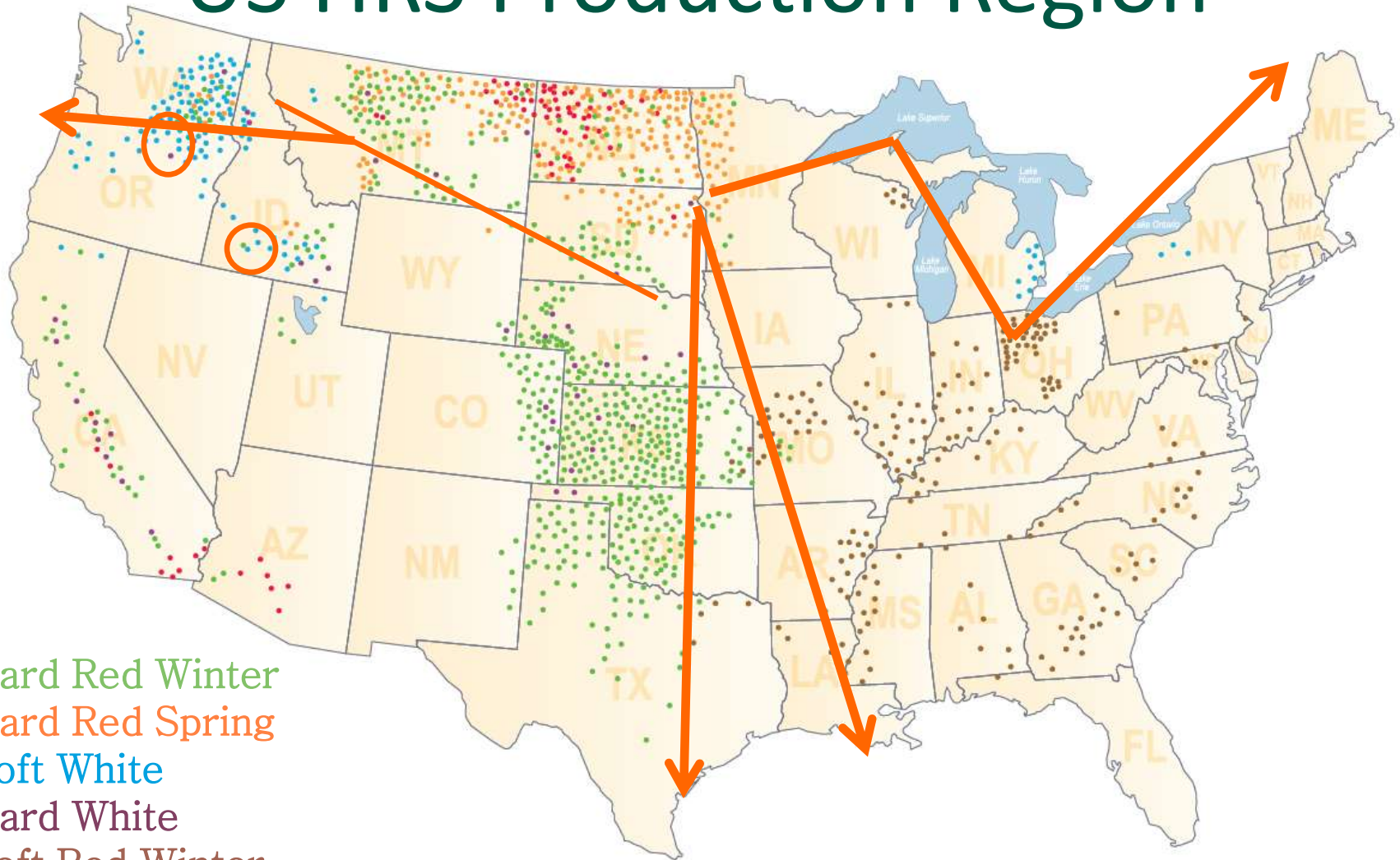
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North Dakota State University**

**2013 China ‘Better for You Foods’
Conference and Exhibition**

U.S. Wheat Classes

- What differentiates the different classes?
 - Protein Content and gluten strength
 - Bran (seed) coat color
 - End use characteristics
 - “Functionality”

US HRS Production Region



Hard Red Winter

Hard Red Spring

Soft White

Hard White

Soft Red Winter

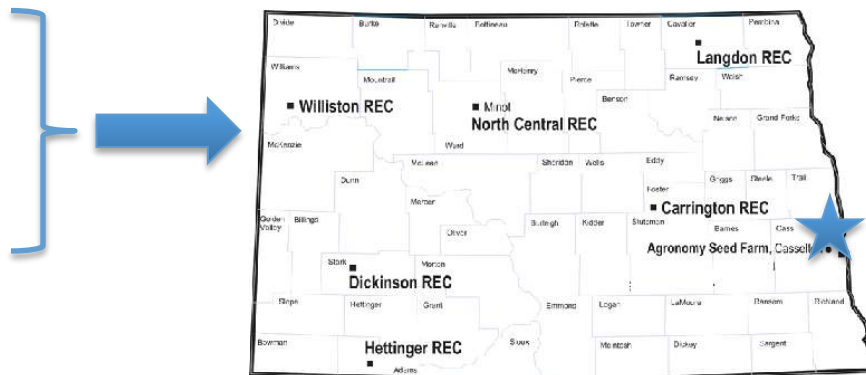
Durum

NDSU NORTH DAKOTA
STATE UNIVERSITY

U.S. Wheat Classes

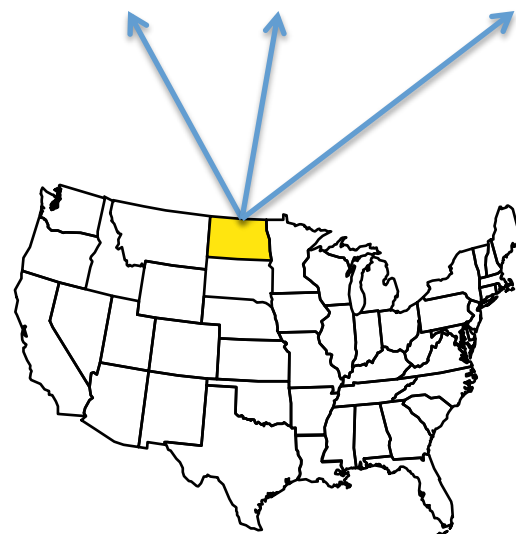
HARD

- Hard Red Spring Wheat
- Hard Red Winter Wheat
- Durum Wheat
- Hard White Wheat



SOFT

- Soft White Wheat
- Soft Red Winter Wheat

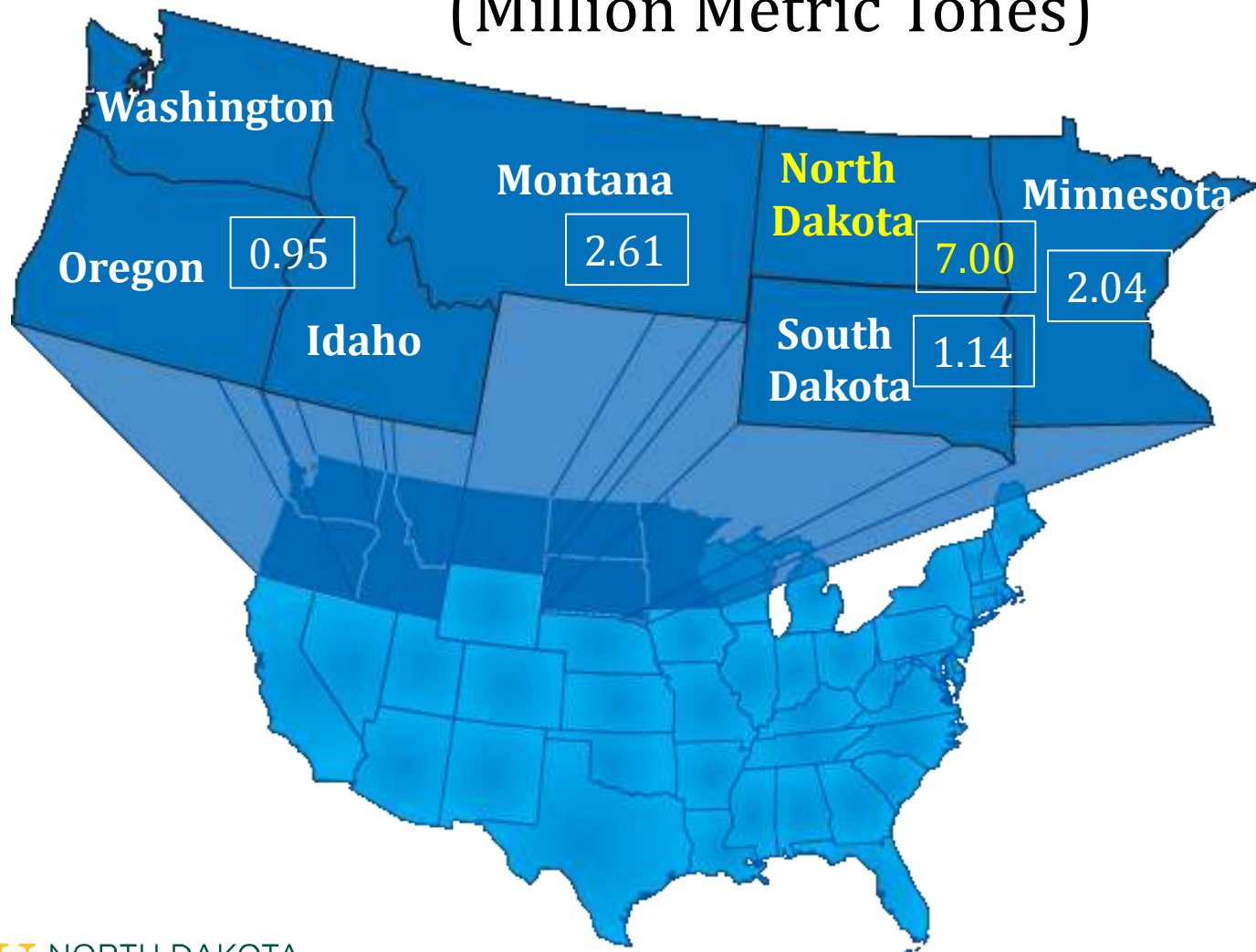


Hard Red Spring Wheat

- Grown In the Upper Great Plains States
- Highest protein content of bread wheats
- Strong Gluten and High Water Absorption

HRS Wheat Production

(Million Metric Tones)



Hard Red Spring Wheat



- Hearth & Pan Breads
- Bagels & Rolls
- Croissants
- Pizza Crusts
- Hamburger Buns
- Frozen Doughs
- Par-Baked
- Blending Wheat

Hard Red Spring Wheat

- Blended with lower protein wheat
 - Increases “gluten” protein content and strength
 - Improves baking performance.
 - Increases strength and “bite” of noodles
- Blended with durum for pasta.
 - Produces better quality pasta than other bread (common) wheat

Hard Red Spring Wheat

- Advantages
 - High protein content
 - Excellent protein “gluten” quality
 - Strong mixing strength
 - Good extensibility
 - Long stability time to over-mixing
 - Great for increased mechanization

Protein – Quantity & Quality

- As protein content and quality increase
 - “Baking absorption” increases
 - Tolerance to over-mixing increases
 - Dough handling properties improve
 - Loaf volume increases
- High quality “gluten” is the baker’s main reason for choosing HRS wheat flour

U.S. HRS Wheat Subclasses

- Dark Northern Spring (DNS) at least 75% of the kernels must be dark, hard and vitreous.
- Northern Spring (NS) contains 25 to 74% dark, hard and vitreous kernels.
- Red Spring (RS) less than 25% dark, hard and vitreous kernels.



Durum Spring Wheat



- High Quality Pasta
 - Bright Yellow Color
 - “Al dente” Texture
 - High Protein
- Cous-Cous
- Durum Breads

Durum Subclasses

- Hard Amber Durum (HAD) at least 75% of the kernels must be hard and vitreous.
- Amber Durum (AD) between 60 and 74% hard and vitreous kernels.
- Durum (D) Less than 60% hard, vitreous kernels.

Hard Red Winter Wheat



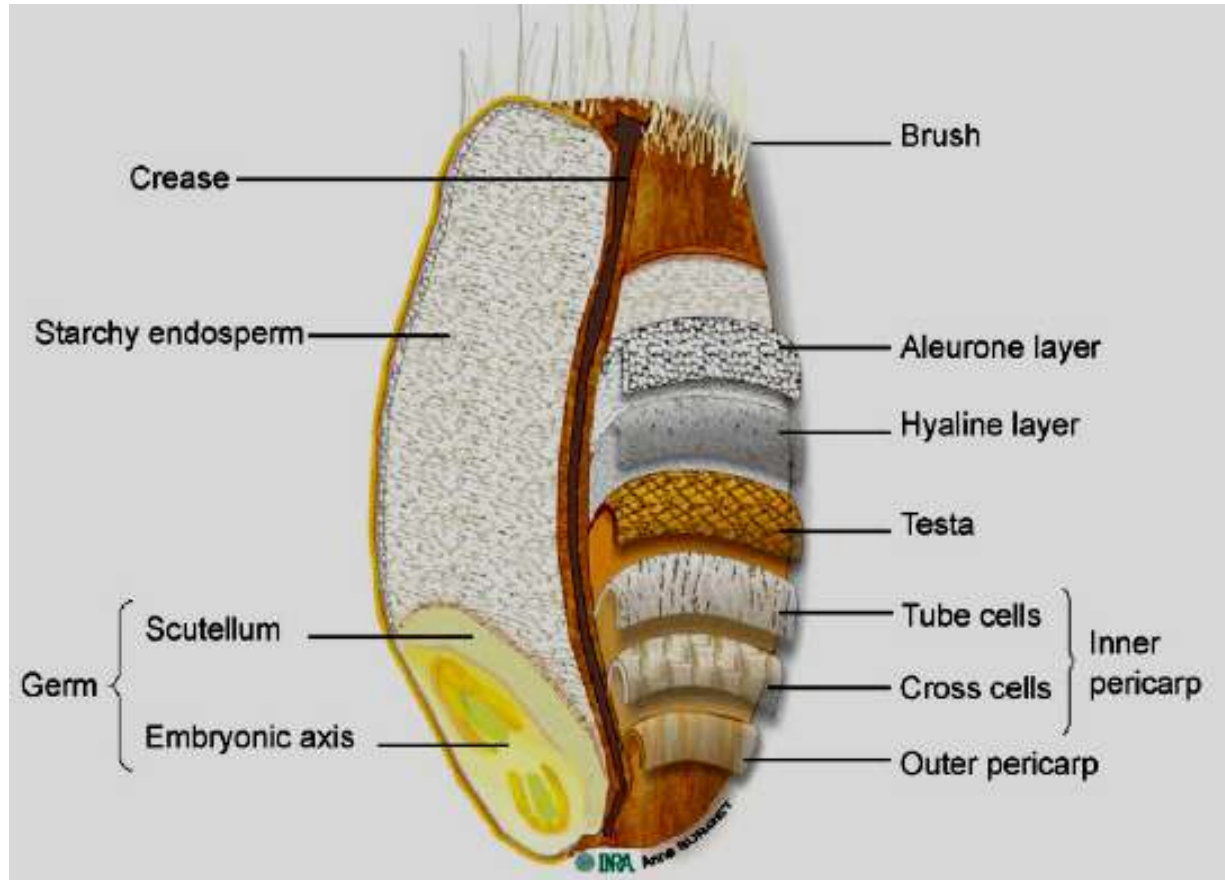
- Pan Breads
- Asian Noodles
- Hard Rolls
- Flat Breads
- General Purpose Flour

Uses of Hard Red Winter Wheat

- Yeast leavened bread products
- Buns, Rolls, Pan Bread

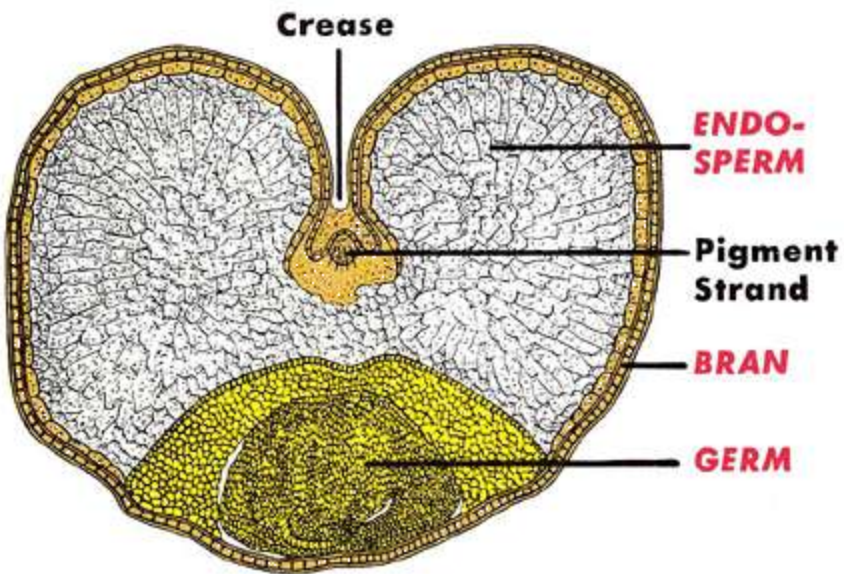


WHEAT IS UNIQUE!

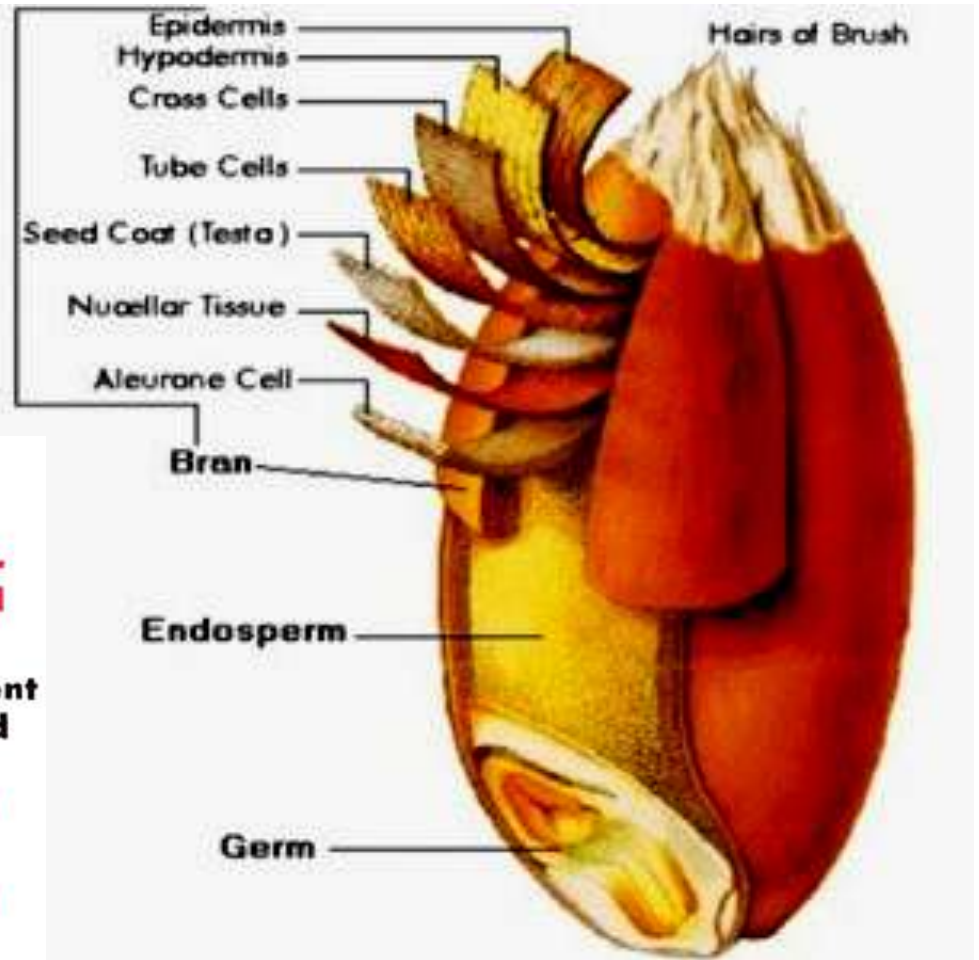


Wheat and Flour

- Wheat ranks the world's most important cereal crop!
- Wheat is unique; although other seeds or cereal grains contain gluten-like protein none is capable of combining or functioning in the same way as the viscoelastic gluten of wheat.
- Kernels are small
 - 5-8 mm and 35 mg (13,000 kernels/lb)
- Each kernel consist of three anatomical parts
 - Germ
 - Bran
 - Endosperm



Cross Section View



<http://www.classofoods.com/fotos/F%20tarwekorrel%2001.jpg>

<http://www.namamillers.org/images/CrossSectionViewofWheat.gif>

Wheat

- Bran forms the protective covering of the grain; the germ develops into a new plant on germination; and endosperm holds the reservoir of food for growing seedling.
- Wheat kernels consists of 2-3% germ, 13-17% bran and 80-85% endosperm.

Wheat Kernel and Flour Contents

(weight, ash, protein, lipid and crude fiber contents of the main anatomical parts of the wheat kernel and of flours varying in milling extraction rates)

Parameter	Wheat Kernel Fractions				Milling Extraction		
	Pericarp	Aleurone Layer	Starchy Endosperm	Germ			
Weight %	9	8	80	3	75	85	100
Ash %	3	16	0.5	5	0.5	1	1.5
Protein %	5	18	10	26	11	12	12
Lipid %	1	9	1	10	1	1.5	2
Crude Fiber %	21	7	>0.5	3	>0.5	0.5	2

(Pomeranz and MacMasters 1968)

Bran

- About 14.4% of the kernel
- Protective “skin” formed by many layers
- Included in whole wheat flour, varying amounts in “white flour”
- Very low fat
- High in mineral and vitamins
- Contains about the 19% of the total protein
 - No gluten-forming proteins
- High in cellulose and arabinoxylans

Germ

- About 2.5% of the kernel
- The embryo or sprouting section of the seed
- Usually separated because of it contains fat
 - Limits the keeping quality of whole wheat flours (polyunsaturated)
 - Available separately as human food
 - Contains about 8% of the total protein
 - Many enzymes
 - Fairly high in ash
 - High in fat soluble vitamins
 - A, E, K

Endosperm

- About 83% of the kernel
- Source of white flour
- “Starchy” endosperm
- 70-75% of the total protein
 - Mostly gluten-forming proteins
 - Forms matrix around the starch granules
- Cells are high in arabinoxylans
 - No cellulose
- Very low mineral content

Health benefits of wheat

- excellent sources of numerous unique substances rating among biologically active compounds such as
 - dietary fiber (arabinoxylans, cellulose, lignin and lignans),
 - Sterols and tocopherols,
 - tocotrienols,
 - alkylresorcinols, phenolic acids,
 - Vitamins and microelements.

Whole Wheat Meals

- Whole grains are a good source of B vitamins, vitamin E, magnesium, iron and fiber.



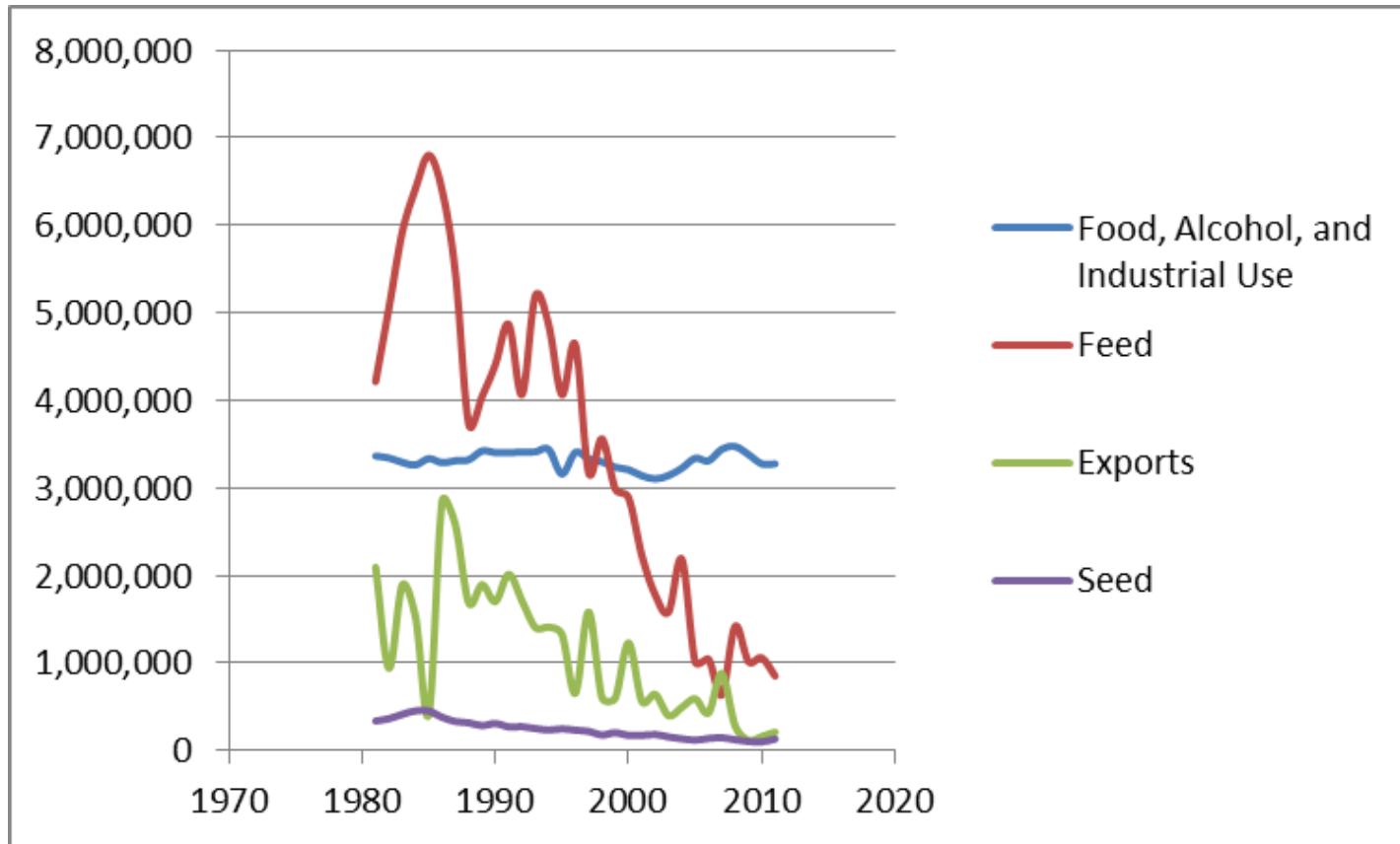
Whole wheat can help

- Protect against many types of cancer and other diseases.
- Decrease heart disease
- Control weight
- Keep bowel habits regular

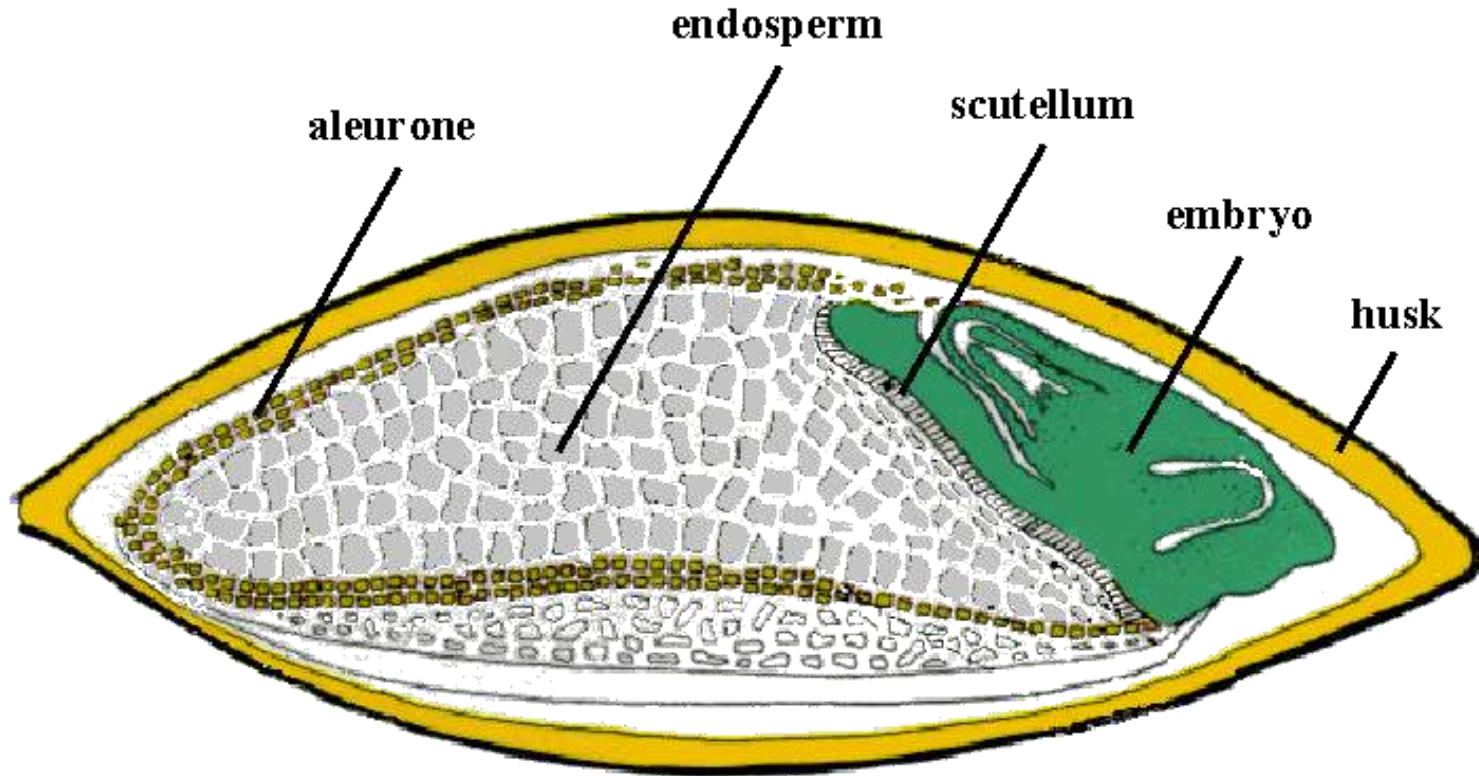
NORTH DAKOTA BARLEY



Barley utilization – U.S. Production (metric tons: USDA-ERS, 1981 – 2011)



Barley Grain



Health benefits of barley

- Barley foods, like oat products, are an excellent source of beta-glucan soluble fiber.
- The beta-glucan content of whole-grain barley is equivalent to or greater than that found in whole-grain oats

Health benefits of barley

- Consumption of whole-grain barley products is consistent with the 2005 Dietary Guidelines for Americans that recommend eating at least three servings of whole grains daily.
- A comprehensive review of the scientific evidence suggests that increasing whole-grain consumption can reduce the risk of coronary heart disease and diabetes, and can help with weight maintenance

Barley vs Oats

Nutrient	Barley (per 100g)	Oats (per 100g)
Calories (Kcal)	354	389
Protein (g)	12.48	16.89
Fat (g)	2.30	6.9
Total Carbohydrate (g)	73.48	66.27
Total Dietary Fiber (g)	17.3	10.6
Beta-Glucan (g)	4.3-5.5 ²	2.2-6.6 ³

Health benefits of barley

- Reducing Risk of coronary heart disease (CHD) and elevated blood cholesterol levels in the U.S.
- The Food and Drug Administration (FDA) approved CHD risk reduction health claim for beta-glucan soluble fiber from barley.
- Reducing blood cholesterol with barley.
- Reducing blood cholesterol with barley
- Increasing satiety with barley

Barley Products



Barley Products



Barley Tea



Hulless Barley Seeds

Barley Tea



<http://steepster.com/teas/dong-suh/12136-barley-tea>

Barley Products



Barley Soup



**Thank you very
much for your
attention!
Questions?**

